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(54) A DEVICE AT COMBINE HARVESTERS EQUIPPED WITH ROTARY STRAW CHOPPER.

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GB-A- 4 220 ✓

SE-A- 75 354 c ✓

US-A- 3 669 123 ✓

GB-A- 5 201 ✓

US-A- 3 450 286 ✓

US-A- 4 637 406 ✓

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Description

The present invention refers to a combine harvester comprising a rotary straw chopper, a cleaning device for separation of chaff from grain and a chaff discharging means associated with said cleaning device for discharging chaff to the rotary straw chopper having an axis of rotation extending transversely to a longitudinal dimension associated with said combine harvester; a housing extending about said rotary straw chopper, said housing defining an inlet into said rotary straw chopper and an outlet from said rotary straw chopper, said outlet being circumferentially spaced from said inlet, wherein said rotary chopper is designed as a lateral flow blower which is arranged to create a negative pressure at its inlet, and wherein the outlet of the cleaning device is directed obliquely towards the fall-out area of the straw above the inlet of the rotary chopper.

BACKGROUND OF THE INVENTION

Combine harvesters generally have a pickup reel with a cutting table, which can be twice as broad as the breadth of the harvester. This means that during harvest of straw fodder plants, the chaff after the threshing will be deposited on the field in a rather narrow string, which mainly corresponds to the width of the cleaning device. It nowadays is usual that the straw after threshing is cut and spread over an area mainly corresponding to the width of the cutting table, in order thereupon to be ploughed down into the soil. The field therefore will have row-formed areas, where the content of disintegrated straw and chaff is bigger than in adjacent areas, which almost entirely lack an admixture of chaff. This uneven distribution results in different growth conditions due to the fact that the growth is hampered in the areas where the soil contains too much disintegrated, but non-mouldered straw and chaff.

Earlier is known threshing machines for threshing cut straw fodder plants, where the chaff from the cleaning device is supplied to a rotary chopper or a straw shredder. The purpose of this mixing of straw and chaff is to improve the nutritional value, in the case straw is used as fodder. For this reason the rotary chopper outlet is usually equipped with a pressing device, which crushes the straw and the ears.

It however has proven itself that the known technique is impossible to use, as the modern rotary chopper creates a positive pressure about the rotor, which pressure is so big that the chaff is blown away causing a blocking of the straw inlet. It also has been tried to feed the chaff tangentially in through a separate opening in the rotary chopper

or the straw shredder, but the same problem also occurs in this case, i.e. that the positive pressure from the rotor prevents the chaff from entering the rotary chopper. According to another suggestion (British patent No 4220 from 1893) the chaff is transported by means of a particular blower via a conduit system to a position above the inlet of the rotary chopper. In order to transport the quantities of chaff concerned it is required a rather big positive pressure in the blower, which means that an air cushion is created above the rotary chopper, which may cause the straw feed to be blocked.

US-A-4637406 discloses a combine harvester equipped with impact straw cutters, a cleaning device and a rotary chopper which is designed as a lateral flow blower. This prior art combine harvester is provided with separate inlets, one for straw and the other for chaff. A positive pressure causes the lighter chaff particles to blow away so that not all of the chaff particles will enter the chopper. The inlet can be jammed by accumulation of straw and chaff at the inlet.

US-A-3450286 discloses a combine harvester equipped with a pivoted conveyor for transporting straw from the outlet of the cleaning device obliquely upwards towards the fall-out area of the straw above the inlet of the rotary chopper.

The purpose and most important features of the invention

The purpose of the invention is to provide a device by which the chaff is spread over the full harvesting breadth of the combine harvester and is also efficiently admixed with the disintegrated straw, thus that a continuous and even distribution can be obtained on the field. The device thereby must be such that it does not affect the transport of the non-chopped straw to the rotary straw chopper or that the separation of the grain from the chaff is influenced negatively. It furthermore should be possible, if the rotary chopper is disengaged, e.g. if the straw shall be laid in rows, to deposit the chaff as earlier in a narrow row or alternatively to spread it over the full harvesting breadth of the combine harvester, without the straw thereby being disintegrated. These tasks have been solved in that the inlet into the rotary straw chopper is defined above said chopper, that means for directing a flow of straw toward a fall-out region are defined above said inlet and wherein said chaff discharging means includes means to cause the chaff to be discharged into said fall-out region to be mixed with the straw prior to reaching said inlet of said rotary straw chopper, and that the chaff discharging means are effective to create a flow of air having a pressure within the fall-out region that slightly exceeds atmospheric pressure, said flow of air trans-

porting the chaff to the fall-out region.

Description of the drawings

The invention hereinafter will be further described with reference to some embodiments.

Fig. 1 shows schematically the rearmost part of a combine harvester, partially in section, and at the straw outlet of which is arranged an rotary chopper.

Fig. 2 shows a view corresponding to Fig. 1, in which the transport device according to the invention is constituted i.a. by an auxiliary blower.

Fig. 3 shows likewise the rearmost portion of a combine harvester of another type equipped with the transport device according to the invention in the form of a belt conveyor.

Description of embodiments

In the drawings 11 designates the rearmost part of a combine harvester, 12 is a rotational separator which forms part of the threshing machine of the combine harvester, 13 is a cleaning device, which consists of a plurality of sieves 14 and a cleaning blower 15. An rotary chopper 16 is provided in connection to the straw outlet 17 of a combine harvester. The straw chopper 16 is designed also to act as a transverse flow blower and is in due course equipped with a knife rotor 18, which cooperates with stationary counter knives 19, which are adjustable in different inclinations in order to be adaptable to different types of goods to be cut. The apparatus housing 20 of the rotary chopper is designed with only two openings, one inlet opening 21 for the non-cut straw 22 and one outlet opening 23 to which is also connected a spreading device 24.

At conventional combine harvesters the chaff 25 has been let out on the field through an opening directly after the sieves 14, which outlet opening is situated in front of the rotary chopper 16, and without communicating therewith. The chaff 25 is separated from the more heavy grains at the passage through the sieves 14, whereby more light material is blown away in a direction towards the outlet opening 33 of the cleaning device 13 by means of the air flow caused by the cleaning blower 15. Instead of as usually discharging the chaff in front of the rotary chopper, the combine harvester according to the invention is so designed, that a transport device 26, e.g. in the form of a duct 27 establishes a passage between the outlet 33 of the cleaning mechanism 13 and the inlet 21 of the rotary chopper 16, such as shown in Fig. 1. The duct 27 therefore does not require to have a closed cross section but can be more or less open.

If the conventional cleaning blower 15 of the combine harvester should have a too small effect for

transporting the chaff to the inlet 21 of the rotary chopper or if the air pressure from the threshing machine 12 should be so big that air is pressed "backwards" into the cleaning device, which could prevent the chaff from reaching the rotary chopper, it is suitable to provide an auxiliary blower 28, which is located thus that the air flow caused by the blower creates a counter-pressure to the air pressure from the threshing machine, which air pressures are balanced thus that the flows of material from the threshing machine and the cleaning apparatus will not obstruct each other. Such an embodiment is shown in Fig. 2, where the auxiliary blower 28 opens in the bottom of the casing 29 of the cleaning device 13. The connecting sleeve coupling 30 of the auxiliary blower 28 is directed towards the passage 27, and thereby supports the flow of air created by the cleaning blower 15.

In some combine harvesters the threshed straw is transported from the threshing machine via vibrating table 31 to the straw outlet 17 of the combine harvester and if a disintegration of the straw is desired then this is transported to the rotary chopper 16. At these combine harvesters, shown in Fig. 3, the space between the cleaning device and the rotary chopper 16 may be so big that flow of air from the cleaning blower 15 is insufficient for transporting the chaff to the inlet opening 21 of the rotary chopper. For such combine harvesters the transport device 26 is preferably designed as a belt conveyor 32 or the like, which extends from the outlet opening 33 of the cleaning device 13 to a position above the inlet opening 21 of the rotary chopper 16. The width of the endless belt conveyor 32 corresponds to the width of the outlet opening 33 of the cleaning device 13. In order not to disturb the flow of material on the belt conveyor 32 there is arranged a partition 34 between the vibrating table 31 and the upper part of the belt conveyor 32.

The straw outlet 17 of the combine harvester is conventionally equipped with horizontal guides 35, along which the rotary chopper may be displaced or be swung away if the straw shall be deposited in rows. It however also is possible to open a (not shown) shutter above the rotary chopper and to let out the non-cut straw this way, whereas the cutter is used for spreading the chaff over the full working area of the combine harvester.

The invention is described in a number of embodiments and it is applied in different modified connections. It of course is fully within the scope of the invention to combine structural details from one embodiment with corresponding details from another embodiment, but also a combination of details from different varieties are possible. The belt conveyor thus can be used at the combine harvester shown in Figs 1 and 2 and the passage and the auxiliary blower at the embodiment according

to Fig. 4.

The invention is neither limited to the embodiments shown but a plurality of variants are possible within the scope of the claims.

Claims

1. A combine harvester (11) comprising a rotary straw chopper (16), a cleaning device (13) for separation of chaff (25) from grain and a chaff discharging means associated with said cleaning device (13) for discharging chaff to the rotary straw chopper (16) having an axis of rotation extending transversely to a longitudinal dimension associated with said combine harvester; a housing (20) extending about said rotary straw chopper (16), said housing (20) defining an inlet (21) into said rotary straw chopper and an outlet (23) from said rotary straw chopper, said outlet being circumferentially spaced from said inlet, wherein said rotary chopper is designed as a lateral flow blower which is arranged to create a negative pressure at its inlet (21), and wherein the outlet (33) of the cleaning device is directed obliquely towards the fall-out area of the straw above the inlet (21) of the rotary chopper, characterized in that the inlet (21) into the rotary straw chopper is defined above said chopper, that means (12) for directing a flow of straw (22) toward a fall-out region are defined above said inlet (21) and wherein said chaff discharging means includes means (15) to cause the chaff (25) to be discharged into said fall-out region to be mixed with the straw (22) prior to reaching said inlet of said rotary straw chopper, and that the chaff discharging means (15) are effective to create a flow of air having a pressure within the fall-out region that slightly exceeds atmospheric pressure, said flow of air transporting the chaff (25) to the fall-out region.
2. A combine harvester as claimed in claim 1, characterized in, that the air flow from the cleaning blower (15) is intensified by means of an auxiliary blower (28) provided at or in connection to the outlet (33) of the cleaning device (13).

Patentansprüche

1. Mähdreschmaschine (11) mit einem Strohrotationsschneider (16), einer Auskörnvorrichtung (13) zum Abtrennen von Spreu (25) von Korn und einer Spreuabführeinrichtung, die der Auskörnvorrichtung (13) zum Abführen von Spreu zu dem Strohrotationsschneider (16) zugeordnet

ist, der eine Drehachse aufweist, die sich quer zu einer dem Mähdrescher zugeordneten Längsabmessung herum erstreckt; mit einem Gehäuse (20), das sich um den Strohrotationsschneider (16) erstreckt und einen Einlaß (21) in den Strohrotationsschneider sowie einen Auslaß (23) von dem Strohrotationsschneider bildet, wobei der Auslaß in Umfangsrichtung von dem Einlaß beabstandet ist, wobei der Rotationsschneider als ein Seitenstromgebläse ausgebildet ist, das so angeordnet ist, daß es an seinem Einlaß (21) einen negativen Druck erzeugt, und wobei der Auslaß (33) der Auskörnvorrichtung quer schräg zu Herausfallbereich des Strohs oberhalb des Einlasses (21) des Rotationsschneiders ausgerichtet ist, dadurch gekennzeichnet,

daß der Einlaß (21) in den Strohrotationsschneider oberhalb des Schneiders ausgebildet ist, ⁴⁾ ^{2.} ^{5) \downarrow $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$} ⁷⁾ ^{1/.} ⁸⁾ ^{5.} ⁹⁾ ^{6.} ~~daß~~ Mittel (12) zum Richten eines Strohstroms (22) zu dem Herausfallbereich oberhalb des Einlasses (21) ausgebildet sind, und wobei die Spreuabführeinrichtung eine Einrichtung (15) umfaßt, durch die das Spreu (25) veranlaßt wird, in den Herausfallbereich abgeführt zu werden, um mit dem Stroh (22) vor Erreichen des Einlasses des Strohrotationsschneiders vermischt zu werden, und daß die Spreuabführeinrichtung (15) dahingehend wirkt, daß sie einen Luftstrom erzeugt, der in dem Herausfallbereich einen Druck aufweist, der den Atmosphärendruck geringfügig übersteigt, wobei der Luftstrom das Spreu (25) zu dem Herausfallbereich transportiert.

2. Mähdreschmaschine nach Anspruch 1, dadurch gekennzeichnet, daß der Luftstrom von der Auskörnvorrichtung (15) mittels eines Hilfsgebläses (28) verstärkt wird, das am oder in Verbindung mit dem Auslaß (23) der Auskörnvorrichtung (13) vorgesehen ist.

Revendications

1. Moissonneuse-batteuse (11) comprenant un hache-paille rotatif (16), un dispositif de triage (13) permettant de séparer la paille hachée (25) du grain et un dispositif d'évacuation de la paille hachée associé audit dispositif de triage (13) pour évacuer la paille hachée vers le hache-paille rotatif (16), dont l'axe de rotation est agencé transversalement par rapport à la direction longitudinale de ladite moissonneuse-batteuse ; un carter (20) disposé autour dudit hache-paille rotatif (16), ledit carter (20) comprenant une entrée (21) dans ledit hache-paille rotatif et une sortie (23) dudit hache-paille rota-

FIG 1

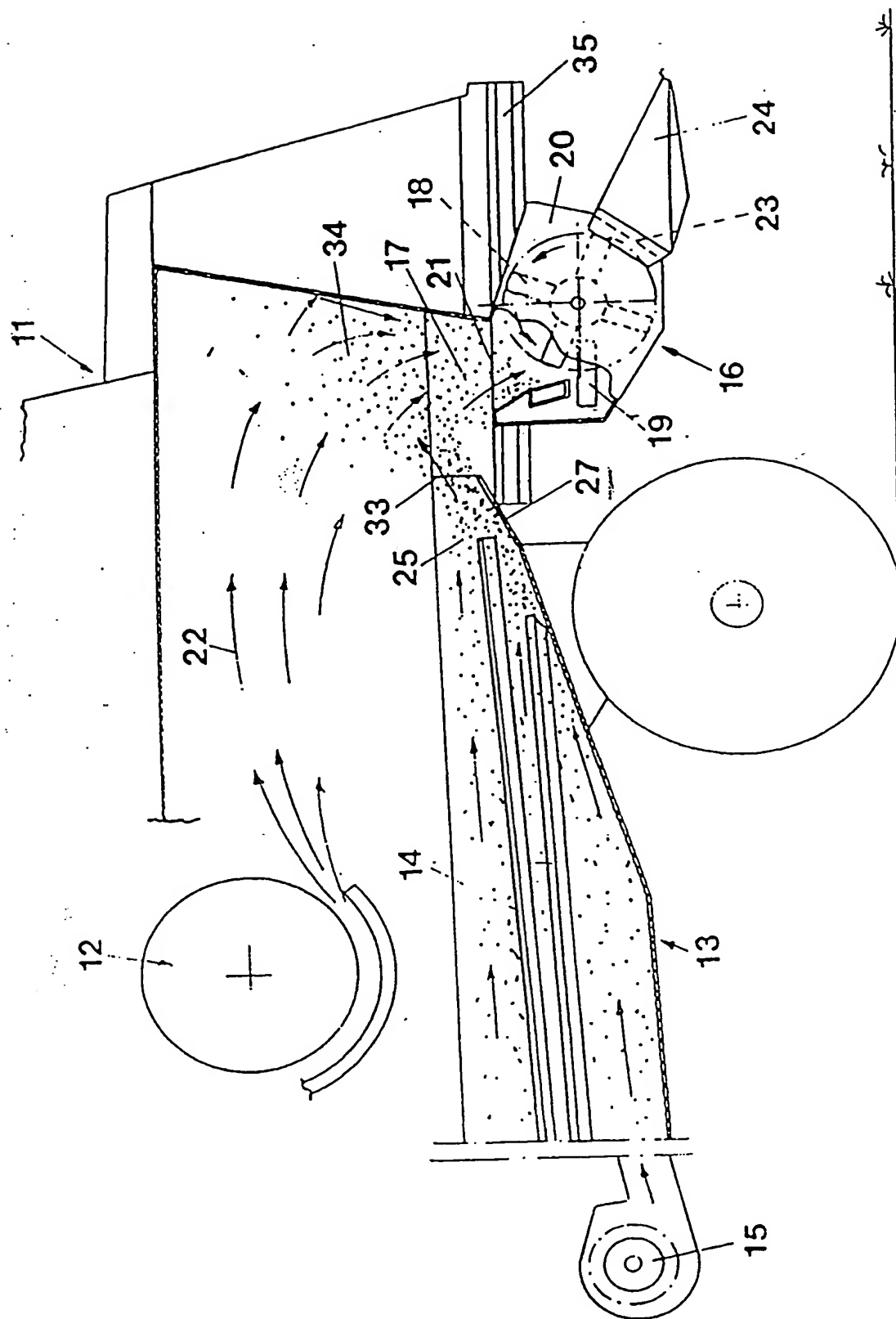


FIG 2

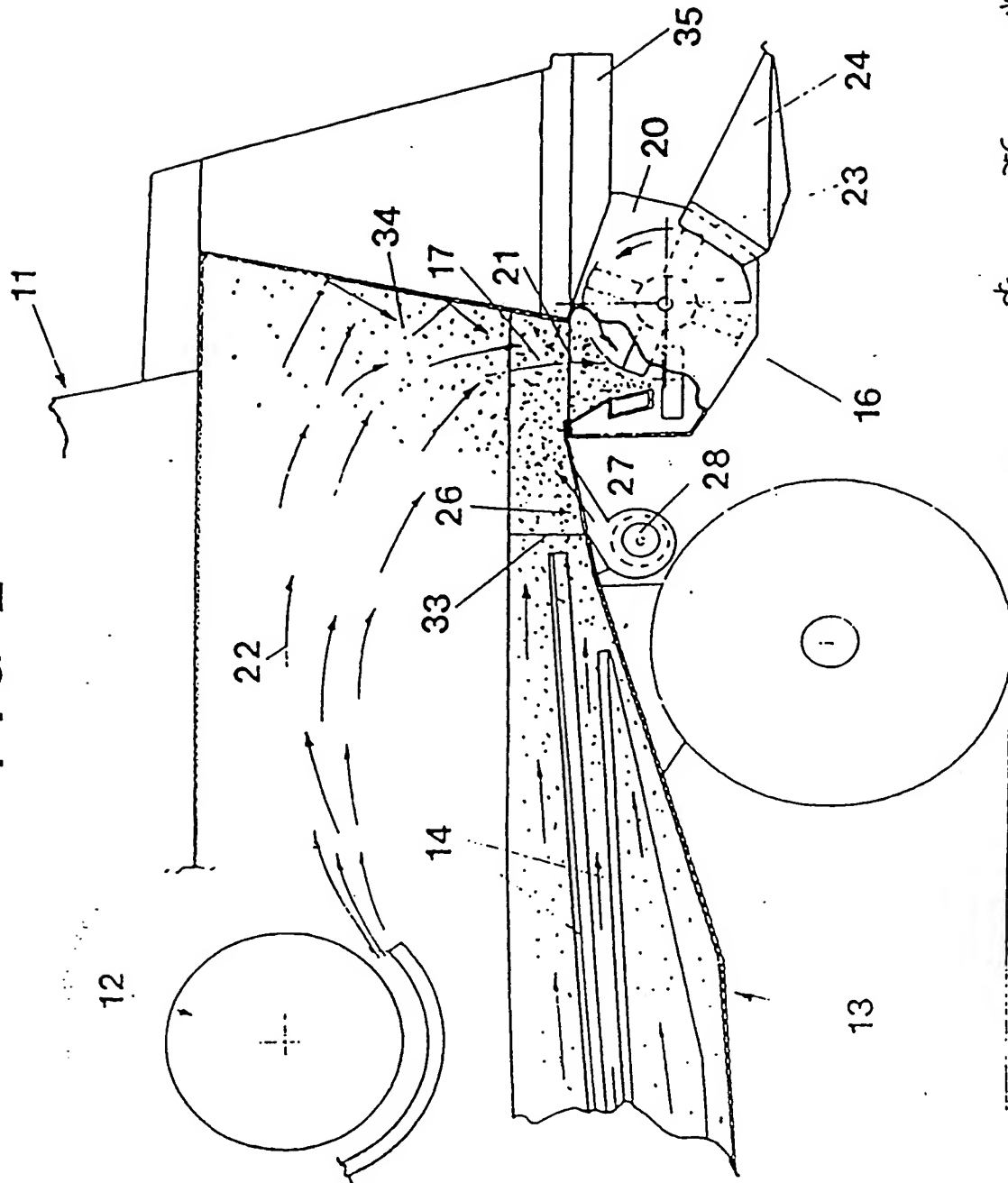


FIG 3

